

CANOE PASS BRIDGE

State Route 20 spanning the Canoe Pass  
Anacortes vicinity  
Skagit County,  
Washington

HAER No. WA-104

HAER  
WASH  
29 ANAC.V  
1-

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

PHOTOGRAPHS

XEROGRAPHIC COPIES OF COLOR TRANSPARENCIES

HISTORIC AMERICAN ENGINEERING RECORD

CANOE PASS BRIDGE

HAER No. WA-104

HAER  
WASH  
29-ANAC.V  
1-

Location: Spanning Canoe Pass between Canoe Island and Fidalgo Island in Skagit County on state route 20, beginning at mile point 42.04

UTM: 10/526300/5361680  
10/526380/5361560

Quad: Deception Pass, Wash.

Date of Construction: 1935

Engineer: Washington Department of Highways,  
O. R. Elwell, Bridge Engineer

Fabricator: Puget Construction Company of Seattle  
Wallace Bridge and Structural Steel  
Company of Seattle, steel fabricator

Owner: Washington Department of Highways,  
since 1977 Washington State Department  
of Transportation, Olympia, Washington

Present Use: Vehicular and pedestrian traffic

Significance: This steel arch and the Deception Pass cantilever bridge (HAER No. WA-103) are examples of advanced steel bridge construction. They also provide motor vehicle and pedestrian access to isolated Whidbey Island.

Historian: Robert W. Hadlow, Ph.D., August 1993

### History of the Bridge

The Washington Department of Highways completed the Deception Pass Bridge and its sister structure, the Canoe Pass Bridge, in 1935 as a New Deal interagency project financed through the federal Public Works Administration, the Washington Emergency Relief Administration, and county funds. The 900' steel cantilever and the 450' steel arch provided a vital link for road transportation between Whidbey Island, Fidalgo Island, and the mainland. Advances in cantilever and arch design and the use of silicon steel made both structures economical and aesthetically pleasing examples of early twentieth-century steel bridge construction.

Captain George Vancouver, an eighteenth-century English mariner on a mission of discovery for his king in the 1790s explored and charted many sites around and including Puget Sound in the northwest corner of what became the state of Washington. For two months in 1792 he and his men explored the inland sea and named many of the principal bays, inlets, and other geographical features, including Admiralty Inlet, Port Orchard, Port Discovery, Possession Sound, Whidbey and Vashon Islands, and Deception Pass.<sup>1</sup>

Spanish explorers had first charted the water passage separating Whidbey Island from Fidalgo Island and connecting the northern end of Skagit Bay with the southern end of Rosario Strait in 1791. One of George Vancouver's officers, Joseph Whidbey, in 1792, discovered that the opening to the sea was nearly impassable for even small vessels. At its mouth, a small rocky islet, Pass Island, breaks it into two channels, the smaller, Canoe Pass, measuring 75 yards, and the larger, Deception Pass, measuring 200 yards. The narrow channels with rapid tidal action and abundant rocky outcroppings made for treacherous passages. While at first believing the larger one was a good route to the inner waters, Vancouver changed his views upon hearing Whidbey's report, instead seeing it as a "deception."<sup>2</sup>

Whidbey Island became popular for crop production because of its fertile soil, but its separation from the mainland gave it an isolated existence. Ferry travel directly to mainland and across Deception Pass to Fidalgo Island were Whidbey Island's only connections with other Washingtonians. By 1907, Captain George Morse, a local mariner and legislator, pushed a bill through the state assembly that called for building bridges over Deception and Canoe passes, linking Whidbey Island with Fidalgo Island, which by then had bridges connecting it with the mainland. A year later, site studies were completed and Morse had secured \$20,000 from the legislature for bridge approaches. At the 1909 Alaska-Yukon Exposition, in Seattle, Morse unveiled miniature

models of his proposed bridges--through-truss spans.<sup>3</sup> Captain Morse's dream ended in failure as the state, in establishing new spending priorities, reappropriated money allotted for the Deception Pass bridges to other projects. Locals continued to lobby for the spans. In 1921, Nils Anderson attempted to convince legislators that it was of military necessity to bridge the passes to give Fort Casey, on Whidbey Island, a road to the mainland. His bill was defeated. In 1928, the Deception Pass Bridge Association formed to promote the bridges' construction. Local Island County and Skagit County representatives Pearl Anderson Wanamaker and William McCracken jointly sponsored legislation in 1929 that state lawmakers passed unanimously. Nevertheless, fearing a loss of her livelihood with the bridges' construction, a local ferry operator used her clout in Olympia and Governor Roland Hartley vetoed the bill. An override campaign was unsuccessful.<sup>4</sup>

In 1930, the Deception Pass Bridge Association reorganized and again pushed for construction. The cause was popular in the state legislature. In 1933, a Wanamaker-sponsored bill passed granting the Washington State Parks committee permission to build the bridges as toll structures if alternate funding through state bond sales failed to materialize. Franklin D. Roosevelt's New Deal economic recovery programs eventually paid for the bridges' construction.<sup>5</sup>

During the summer and fall of 1933, the Washington Department of Highways sent out a location team to survey the proposed bridge sites so that designers could assemble plans. In December 1933, a funding package consisting of \$245,000 from the Washington Emergency Relief Administration and \$150,000 from Island and Skagit counties was approved. The federal Public Works Administration reimbursed the state \$87,000. Construction could have begun immediately except that the PWA under the leadership of Harold Ickes, was slow to release funds. Finally, in the late spring of 1934, the Washington Department of Highways call for bids on the project.<sup>6</sup>

### Design and Description

On 19 June 1934, the highway department awarded a \$304,755 contract to the Puget Construction Company of Seattle to construct the Deception Pass and Canoe Pass Bridges. It called for building the following structures. Reading from north to south they were:

#### Canoe Pass Bridge

one 23' reinforced-concrete T-beam span  
one 50' steel deck truss anchor arm span

one 350' steel trussed two-hinged deck arch span  
one 50' steel deck truss anchor arm span  
one 23' reinforced-concrete T-beam span  
one 15' reinforced-concrete T-beam span  
total length of steel section--450'

Deception Pass Bridge

one 15' reinforced-concrete T-beam span  
one 23' reinforced-concrete T-beam span  
one 175' steel deck truss anchor arm span

One central (center) span composed of these three components:

one 175' steel deck truss cantilever span  
one 200' steel Warren deck truss suspended span  
one 175' steel deck truss cantilever span

one 175' steel deck truss anchor arm span  
one 23' reinforced-concrete T-beam span  
one 15' reinforced-concrete T-beam span  
total length of steel section--900'

Both bridges shared common measurements on several dimensions. Deck trusses measure 18' center-to-center. Roadway width, curb-to-curb, is 22'. Two sidewalks, one on each side of the road deck measured 3'-7". The decks of both bridges were built 180' above mean sea level. The Canoe Pass Bridge was designed as a three-hinged arch under dead load and a two-hinged arch at completion to be less flexible and better able to accommodate heavier live loads. The Deception Pass Bridge and the Columbia River Bridge at Grand Coulee Dam (HAER No. WA-102), also completed in 1934-35, have nearly identical bracing in their main cantilevered spans and suspended spans except for the bottom chords.<sup>7</sup>

Construction of the Deception Pass and Canoe Pass bridges included a complicated but practicable method for pier erection and steel assembly. Excavation of the solid rock began on 6 August 1934 for the first pier's footings. All together, workers used jack-hammers and dynamite to break up 3,300 yard of the rock at all pier sites. Concreting began on the first pier which was poured on 30 August and the last on 19 January 1935. Approach spans used reinforced-concrete columns, while the main spans utilized "U-shaped" bents.<sup>8</sup>

The contractor built a concrete mixing plant on the Whidbey Island side of Deception Pass for the south cantilever piers, laying out 6,000' of pipeline from Cranberry Lake for fresh

water. He then built a second plant to the north of the Canoe Pass for the north arch piers, and piped water 2,000' from Pass Lake. He also erected a cableway connecting Fidalgo Island with Pass Island to transport cement and aggregates to complete the south arch piers and the north cantilever piers.<sup>9</sup>

In the meantime, the Wallace Bridge and Structural Steel Company fabricated the structural steel members and transported them to the job site from Seattle. Specifications called for the liberal use of silicon structural steel because its working stress was higher than working stress for carbon steel. Structural members consisted of rolled channel, or I-section beams, with lattice bracing. Truss panels are 25' long. They are 61' deep at the main piers and taper to 16' at mid span.

Workers began the steel erection in January 1935 by cantilevering out the north half of the Canoe Pass arch from Fidalgo Island. They used a traveler derrick to move the steel members in place to be pin set and later riveted. Once the arch's north half was complete, the derrick was dismantled and sent over to Pass Island by the high line. Then, the arch's south half was cantilevered out and temporarily hinged to the north half.<sup>10</sup>

In March, once the arch was complete, a narrow gauge railroad track was laid across from Fidalgo Island to Pass Island and a 235' temporary trestle erected from the arch to the cantilever construction site. By mid-April, workers using the travelling derrick had constructed the north anchor span and the north half of the cantilever out from Pass Island. Then, they laid track on the Whidbey Island side of the cantilever and reerected the traveler and constructed the south anchor arm and south cantilever span. By early June they were ready to place the 200' suspended span.<sup>11</sup>

Paul Jarvis, founder of the Puget Construction Company, recalled in 1968 that his work crews had a difficult time putting the center span into the Deception Pass Bridge. It was a hot day and when the crane operator lowered the section into place it was three inches too long. Jarvis pulled out his pad and pencil and worked out the coefficient for expansion for the center span. He calculated that a temperature drop of just 30 degrees would shrink the section to allow it to go into place. Before dawn the next morning, when the temperature had indeed dropped thirty degrees, working by floodlight put the span into place and pinned it. By the end of June all deck slabs and concrete side walks were poured and the bridges were completed. All that was left was to finish the basalt masonry and log approach barriers, and place fill on Pass Island to create a road bed between the two bridges.<sup>12</sup>

The official dedication of the Deception Pass and Canoe Pass bridges was held on 31 July 1935. Five thousand people attended the noon event with Pearl A. Wanamaker christening the Deception Pass Bridge with a bottle of sea water. She then cut a ribbon stretched across the structure and officially opened traffic between Whidbey and Fidalgo islands. Dignitaries attending included members of the Deception Pass Bridge Association the Puget Construction Company, and state highway officials. The event was so well attended that Governor Clarence D. Martin and Director of Highways Lacey V. Murrow arrived late because of traffic jams.<sup>13</sup>

After the formal dedication, the crowds retired to nearby Cranberry Lake in Deception Pass Park on Whidbey Island, a recreation area that the Civilian Conservation Corps had only recently improved near the bridges. Families picnicked and listened to musical program presented by the Oak Harbor Drum and Bugle Corp and the Mount Vernon High School Band. Several officials spoke to the crowd about the bridge project's history and Whidbey Island's future. The Standard Oil Company even brought a delivery van equipped with loud-speakers to broadcast the dignitaries' remarks to the gathered crowd. After this was a short water sports program on the lake and an evening banquet for 200 invited guests.<sup>14</sup>

The bridge was popular with motorists. Unofficial tallies taken on the two Sundays after the dedication showed that from 3,000 to 5,000 vehicles crossed the structures each day. Yearly traffic estimates four decades later exceeded 1.5 million. Whidbey Island's population blossomed, with 6,000 inhabitants in 1940 to 33,937 in 1977 to nearly 60,000 by 1990. The bridges gave Whidbey Island a line to the outside world. Since World War II, the U.S. Navy has maintained an air station on the island, employing many people. The island is also a popular tourist destination.<sup>15</sup>

### Repair and Maintenance

Both the Deception Pass Bridge and the Canoe Pass Bridge remain unaltered since their construction. Perennial maintenance problems include poor paint adhesion to the steel sections in the damp salt air environment, causing numerous rusted areas; and plugged drain holes and missing drain hole grates on the concrete deck. Fracture critical inspections in 1989 reported no flaws.<sup>16</sup>

### Data Limitations

The Island County Historical Museum in Coupeville has limited research resources. Its only large collection was several construction photographs of often marginal quality. Articles from local newspapers, professional journals, and popular periodicals proved the greatest sources. An invaluable resource was the Washington State Department of Transportation Bridge Preservation Section's Kardex Card Files and Correspondence Files.

### Project Information

This project is part of the Historic American Engineering Record (HAER), National Park Service. It is a long-range program to document historically significant engineering and industrial works in the United States. The Washington State Historic Bridges Recording Project was co-sponsored in 1993 by HAER, the Washington State Department of Transportation (WSDOT), and the Washington State Office of Archeology & Historic Preservation. Fieldwork, measured drawings, historical reports, and photographs were prepared under the general direction of Robert J. Kapsch, Ph.D., Chief, HABS/HAER; Eric N. DeLony, Chief and Principal Architect, HAER; and Dean Herrin, Ph.D., HAER Staff Historian.

The recording team consisted of Karl W. Stumpf, Supervisory Architect (University of Illinois at Urbana-Champaign); Robert W. Hadlow, Ph.D., Supervisory Historian (Washington State University); Vivian Chi (University of Maryland); Erin M. Doherty (Miami University), Catherine I. Kudlik (The Catholic University of America), and Wolfgang G. Mayr (U.S./International Council on Monuments and Sites/Technical University of Vienna), Architectural Technicians; Jonathan Clarke (ICOMOS/Ironbridge Institute, England) and Wm. Michael Lawrence (University of Illinois at Urbana-Champaign), Historians; and Jet Lowe (Washington, D.C.), HAER Photographer.

SELECTED BIBLIOGRAPHY

- Berentson, Steve. "The Deception Pass Bridge Project--A Story of Dreams, Politics and People." *Oak Harbor Whidbey Island News Times*, 23 June 1977, 1, 11.
- "Bridging Deception Pass." *Seattle Argus*, 31 December 1932, 3.
- "Bridge Fill Under Way At Deception." *Coupeville Island County Times*, 11 July 1935, 1.
- Burton, Joan. "The Great Deception: The Bridge They Built with Love and Politics." *Northwest Living!* 6 (November-December 1988): 42-44.
- "Ceremony Will Take Place At High Noon, Wednesday, July 31." *Coupeville Island County Times*, 25 July 1925, 1.
- "Deception Pass Bridge." *Compressed Air Magazine* 40 (September 1935): 4834.
- "Deception Pass Bridge Now Officially Historical." *Langley South Whidbey Record*, 12 October 1982.
- "Deception Pass Bridge Opened." *Seattle Times*, 1 August 1935.
- "Deception Pass Bridges." *Pacific Builder and Engineer* 42 (1 February 1936): 26-28.
- Duncan, Don. "Don Duncan's Driftwood Diary." *Seattle Times Magazine*, 10 November 1968, 4.
- "5,000 Attend Dedication Ceremonies." *Anacortes American*, 1 August 1935, 1, 5.
- Hadlow, Robert W. "Conde B. McCullough, 1887-1946: Master Bridge Builder of the Pacific Northwest." Ph.D. diss. Washington State University, 1993.
- "Long Steel Bridges Added to Washington System." *Engineering News-Record* 113 (25 October 1934): 519.
- "New Bridge Spans Legendary Deception Pass." *Washington Motor News* 16 (August 1935): 1.
- "News From Olympia." *Seattle Argus*, 21 March 1931, 3.
- "Pass Bridge." *Seattle Post-Intelligencer*, 1 August 1935, 2.

"Pass Bridge Is Dedicated Wednesday at High Noon." *Coupeville Island County Times*, 1 August 1935, 1, 4.

"Plans Made for Deception Bridge Dedication, July 31." *Coupeville Island County Times*, 18 July 1935, 1, 4.

"Plaque Dedicated on Pass Island Fri." *Coupeville Island County Times*, 8 August 1935, 1.

"Program: Bridge Dedication, July 31, 1935." *Anacortes American*, 25 July 1925.

Schwantes, Carlos A. *The Pacific Northwest: An Interpretive History*. Lincoln: University of Nebraska Press, 1989.

[Soderberg, Lisa] "HAER/Washington State Bridge Inventory--Deception Pass, Canoe Pass," held by Washington State Office for Archeology and Historic Preservation, Olympia, WA. 1979.

"The Stroller--The Deception Pass Bridge." *Seattle Argus*, 2 December 1933, 2.

"3,114 Cars Cross Bridge On Sunday." *Coupeville Island County Times*, 8 August 1935, 3.

Washington. Department of Highways. *Fifteenth Biennial Report of the Director of Highways, for 1932-1934*.

Washington. Department of Highways. *Sixteenth Biennial Report of the Director of Highways, for 1934-1936*.

Washington. State Department of Transportation. Bridge Preservation Section. Bridge Files.

ENDNOTES

<sup>1</sup> Vancouver also sought the mouth of North America's great western river. He lost in a race with American interests to merchant captain Robert Gray and his vessel *Columbia*. Vancouver also named Puget Sound for his lieutenant Peter Puget. Carlos A. Schwantes presents a concise history of the region in his volume, *The Pacific Northwest: An Interpretive History* (Lincoln: University of Nebraska Press, 1989), 24, 45.

<sup>2</sup> Currents in Deception Pass attained a velocity of from five to eight knots with strong eddies. "Deception Pass Bridges," *Pacific Builder and Engineer* 42 (1 February 1936): 26.

<sup>3</sup> "Deception Pass Bridge," *Compressed Air Magazine* 40 (September 1935): 4834; Joan Burton, "The Great Deception," *Northwest Living!* 6 (November-December 1988): 42-44; Steve Berentson, "The Deception Pass Bridge Project--A Story of Dreams, Politics and People," *Oak Harbor Whidbey Island News-Times*, 23 June 1977, 1.

<sup>4</sup> Pearl Wanamaker was Nils Anderson's daughter. Joan Burton, "The Great Deception," *Northwest Living!* 6 (November-December 1988): 42-44; Steve Berentson, "The Deception Pass Bridge Project--A Story of Dreams, Politics and People," 1, 11.

<sup>5</sup> *Ibid.*

<sup>6</sup> Oregon experienced delays in receiving PWA funding for its \$5.6 million Oregon Coast Highway bridges project. It believed that federal "red tape" delayed its receipt of funds. See Robert W. Hadlow, "Conde B. McCullough, 1887-1946: Master Bridge Builder of the Pacific Northwest," (Ph.D. diss., Washington State University, 1993), 170-88; for county contributions, Island County gave \$36,800 and Skagit County gave \$55,200, see "Deception Pass Bridges," 28.

<sup>7</sup> "Table No. 16--State Highway Contracts Awarded October 1, 1931 to September 30, 1934, Listed by Contract Numbers," in Washington, Department of Highways, *Biennial Report of the Director of Highways for 1932-1934*, 96; Don Duncan, "Don Duncan's Driftwood Diary," *Seattle Times Magazine*, 10 November 1968, 4; "Long Steel Bridges Added to Washington Highway System," *Engineering News-Record* 113 (25 October 1934): 519; "Deception Pass Bridge," 4834; "Deception Pass Bridges," 26; "Deception Pass Bridge, No. 20/204,"

and "Canoe Pass Bridge, No 20/207," Kardex Card File, Bridge Preservation Section, Washington State Department of Transportation, Olympia, WA [WSDOT].

<sup>8</sup> "Deception Pass Bridges," 26-28; "Deception Pass Bridge," 4834.

<sup>9</sup> Berentson, "The Deception Pass Bridge Project--A Story of Dreams, Politics and People," 1, 11; "Deception Pass Bridge," 4834; "Deception Pass Bridges," 26-28.

<sup>10</sup> "Deception Pass Bridges," 28; silicon steel's working stress was 24,000 pounds per square inch while carbon steel's working stress was 18,000 pounds per square inch. The Deception Pass Bridge used 1,300 tons of steel and the Canoe Pass Bridge used 465 tons of steel. "Long Steel Bridges Added to Washington Highway System," 519; the silicon steel was ASTM A-94-33 and the carbon steel was ASTM A-7-33T. Rivet steel was ASTM A-141-33 with shear capacity of 12,000 pounds per square inch and bearing of 24,000 pounds per square inch. See "Deception Pass Bridges," statistical report [1935], in "Deception Pass Bridge, No. 20/204," Correspondence File, Bridge Preservation Section, WSDOT; Berentson, "The Deception Pass Bridge Project--A Story of Dreams, Politics and People," 11.

<sup>11</sup> "Deception Pass Bridges," 28; "Long Steel Bridges Added to Washington Highway System," 519; Berentson, "The Deception Pass Bridge Project--A Story of Dreams, Politics and People," 11; "Deception Pass Bridges," statistical report [1935].

<sup>12</sup> Duncan, "Don Duncan's Driftwood Diary," 4; Berentson, "The Deception Pass Bridge Project--A Story of Dreams, Politics and People," 11; the suspended span was pin-connected to the cantilever spans to allow for changes in length caused by live load and temperature. Pin-connected links that connected the anchor arms to the anchorage shoes and upset rods running through the anchorage shoes the anchor piers. See "Long Steel Bridges Added to Washington Highway System," 519; "Bridge Fill Under Way at Deception," *Coupeville Island County Times*, 11 July 1935, 1; according to E. N. Hutchinson, Secretary of State for Washington and chairman of the State Parks Committee, the National Park Service helped design the rock and log barrier approaches to the bridges. See "Pass Bridge Is Dedicated Wednesday at High Noon," *Coupeville Island County Times*, 1 August 1935, 4; deck slabs were 6-1/2 inch-thick reinforced concrete with 10-inch curbs. Sidewalks

were 4-inch-thick reinforced concrete. See "Deception Pass Bridges," statistical report [1935].

<sup>13</sup> "Pass Bridge Is Dedicated Wednesday at High Noon," 1, 4; "5,000 Attend Dedication Ceremonies," *Anacortes American*, 1 August 1935, 1, 5.

<sup>14</sup> "Plans Made for Deception Bridge Dedication, July 31," *Coupeville Island County Times*, 18 July 1935, 1; "Ceremony Will Take Place at High Noon, Wednesday, July 31," *Coupeville Island County Times*, 25 July 1935, 1; "Program, Bridge Dedication, July 31, 1935," *Anacortes American*, 25 July 1935; "5,000 Attend Dedication Ceremonies," 1, 5; "Pass Bridge is Dedicated Wednesday at High Noon," 1, 4.; "Deception Pass Bridge opened," *Seattle Times*, 1 August 1935; "Pass Bridge," *Seattle Post-Intelligencer*, 1 August 1935, 2

<sup>15</sup> Berentson, "The Deception Pass Bridge Project--A Story of Dreams, Politics and People," 11.

<sup>16</sup> See yearly inspection reports and fractural critical inspection reports in "Deception Pass Bridge, No. 20/204," and "Canoe Pass Bridge, No. 20/207," in Correspondence Files, Bridge Preservation Section, WSDOT.